A STUDY OF

LUMBOSACRAL TRANSITIONAL VERTEBRA (LSTV) AND ITS SIGNIFICANCE IN LUMBAR DISC SURGERY

Dissertation Submitted to
THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment of the regulations
for the award of the degree of

M.Ch.BRANCH – II

NEUROSURGERY (5- YEARS COURSE)

EXAMINATION AUGUST 2011

2006-2011

DEPARTMENT OF NEUROSURGERY

GOVT. STANLEY MEDICAL COLLEGE

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CERTIFICATE

This is to certify that this dissertation entitled " **A STUDY OF LUMBOSACRAL TRANSITIONAL VERTEBRA AND ITS SIGNIFICANCE IN LUMBAR DISC SURGERY** " submitted by **Dr. I.Mohamed Abith Ali** appearing for M.Ch.Degree Examination in **August 2011** is a bonafide record of work done by him under my direct guidance and supervision in partial fulfillment of regulations of the Tamilnadu Dr.M.G.R. Medical university, Chennai. I forward this to the Tamilnadu Dr. M.G.R. Medical university, Chennai, Tamilnadu, India.

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DECLARATION

I, **Dr. I. Mohamed Abith Ali** solemnly declare that this dissertation **"A STUDY OF LUMBOSACRAL TRANSITIONAL VERTEBRA AND ITS SIGNIFICANCE IN LUMBAR DISC SURGERY"** was prepared by me in the Department of Neurosurgery , Govt. Stanley medical college and Hospital, Chennai under the guidance and supervision of Prof. S.Sundaram M.S., M.Ch., Professor of Neurosurgery, Department of Neurosurgery, Govt. Stanley medical college and Hospital, Chennai between 2007 and 2011.

This dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the university requirements for the award of degree of M.Ch Neurosurgery.

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CONTENTS

INTRODUCTION

INTRODUCTION

Lumbosacral transitional vertebra (LSTV) are congenital spinal anomalies defined as either sacralisation of the lowest lumbar segment or Lumbarisation of the most superior sacral segment of the spine. Lumbarisation is either complete or incomplete fusion of the upper sacral vertebrae, while sacralisation is either complete or incomplete fusion of L5 vertebra to the top of the sacrum.

Correct identification of LSTV is essential because of its clinical implications and surgical management. Inaccurate identification may lead to wrong Localisation in lumbar disc surgery with resultant failed back syndrome.[1]

Surgical errors occurs in low back pain patients when MR imaging confined to the lumbar spine is reported without accompanying conventional radiographs or cervicothoracic MR localizers.

While using intraoperative radiographs during spinal surgery for confirmation of disc level, especially in patients with LSTV anomaly, it is important to correlate prior MRimaging with these radiographs. Correlation of the intraoperative radiograph with the preoperative imaging can avoid surgical intervention at wrong level.

AIM OF STUDY

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- To analyse the incidence of LSTV in low back pain patients.
- To analyse the age /sex distribution of LSTV.
- To analyse the various methods of identifying and numbering LSTV preoperatively through imaging.
- To analyse the various intraoperative measures to avoid surgical intervention at wrong level in patiens with LSTV while doing lumbar disc surgery

REVIEW OF LITERATURE

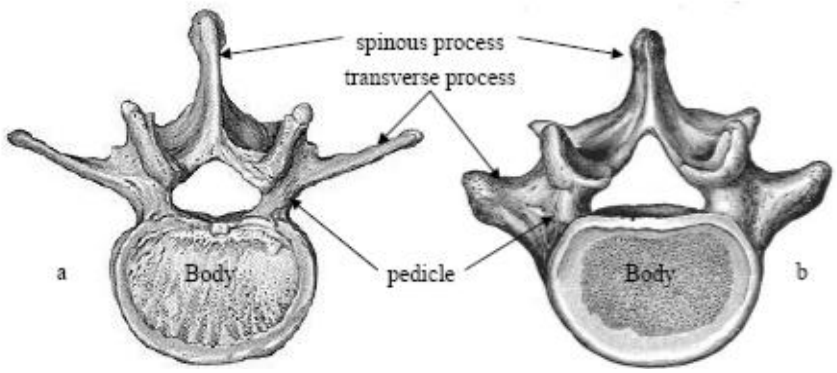
REVIEW OF LITERATURE

The literature is reviewed under the following headings :

1. Anatomy of the Lumbosacral vertebrae .
2. Developmental abnormality in lumbosacral transitional vertebra (LSTV)
3 LSTV and various classification systems.
4 Clinical significance
5 Image Localisation of LSTV
6 Intraoperative level Localisation in lumbar disc surgery.

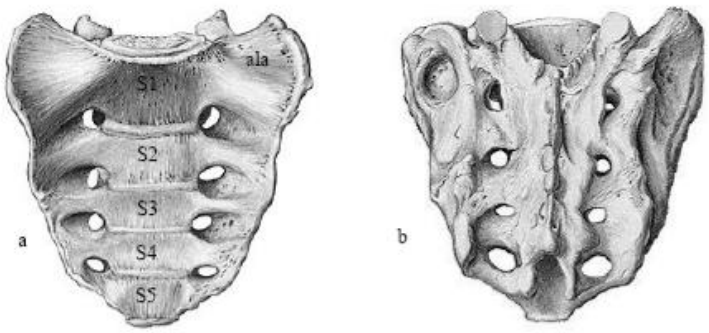
Anatomy of the lumbosacral vertebrae :

In order to understand LSTV variation it is necessary to first understand the normal anatomy of lumbar and sacral vertebrae. Lumbar vertebrae are characterized by a large, kidney-shaped body, slender transverse processes; stout pedicles and lamina; short, thick, square spinous processes; transversely curved articular facets; and lack of foramina transversaria and costal articular facets. All of these features reflect the unique suite of stresses the lumbar spine is subjected to, requiring it to be both strong enough to support the upper body and yet flexible enough to allow the needed mobility . The fifth lumbar vertebra has a distinct appearance from the rest of the lumbar vertebrae, with very wide inferior articular processes, a wedge-shaped body (thicker anteriorly), large, angled pedicles with transverse processes projecting from the entire length of the pedicle, and the largest vertebral body of all the presacral vertebrae.



Superior view of the Fourth (a) and fifth (b) lumbar vertebrae illustrating normal anatomical features and differences in L5 morphology

The sacrum is a bony mass composed of five or six vertebral segments with wide lateral masses, called alae, which articulate with the ilium. The sacro-iliac joint incorporates the first two sacral vertebrae, as reflected by the presence of the auricular surface on the lateral edge of the alae.



Anterior (a) and posterior (b) views of a normal sacrum

Between all presacral vertebrae and between L5 and the sacrum lie intervertebral discs . These discs are composed of an inner nucleus pulposus, and an outer annulus fibrosus. The nucleus pulposus is a gelatinous semi-fluid material, initially comprised of notochord cells which are eventually replaced by cells from the inner annulus fibrosus. The outer annulus fibrosus is primarily composed of collagen fibrils arranged in oblique layers, while the inner annulus fibrosus is fibrocartilaginous . The primary type of collagen in the annulus fibrosus is type I, while type II predominates in the nucleus pulposus.

Disc prolapse, or herniation, is the result of mechanical failure of the intervertebral disc. There are three basic types of herniation: protrusion, extrusion, and sequestration. Protrusion is the condition where the annulus bulges but has not ruptured nucleus material; extrusion is where part of the nucleus has been expelled but is still attached to the rest of the nucleus; and sequestration is where nucleus material has ruptured and is no longer attached to the rest of the nucleus.

This condition can result in pain, possibly due to chemical irritation caused by the release of nitrous oxide into the spinal canal, by compromising a spinal nerve, or by tearing the nerve plexus that surrounds the annulus. However, herniation does not always cause pain, and is present in a modest degree of asymptomatic patients.

DEVELOPMENTAL ABNORMALITY IN LUMBOSACRAL TRANSITIONAL VERTEBRA (LSTV) :

Developmental defects occurring at the lumbosacral border can result in transitional vertebrae that have a mixture of lumbar and sacral characteristics. That is, the morphology of the affected vertebra is intermediary or transitional with a combination of lumbar and sacral anatomical structures. The resulting combination of characteristics

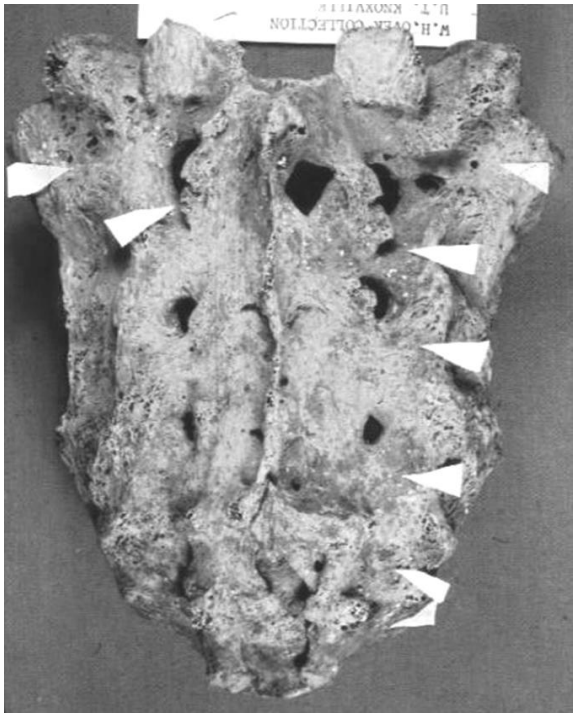
produces a variety of morphological configurations collectively referred to as lumbosacral transitional vertebrae (LSTV).

The developmental defects that result in LSTV are thought to be caused by a delay in the timing threshold events occurring at the lumbosacral junction. Disruption of developmental timing, with resultant defects, can only occur during the vulnerable time when developmental thresholds are reached. This causes developmental fields to overlap or expand beyond normal parameters, resulting in boundary shifts at the transitional areas of the vertebral column. Boundary shifts at the lumbosacral junction can occur caudally (Lumbarisation) or cranially (sacralisation).

Lumbarisation refers to a caudal shift where the first sacral segment assumes some characteristics of the lumbar vertebra. Sacralisation refers to a cranial shift where the last lumbar vertebra assumes sacral characteristics and frequently becomes incorporated into the sacrum. Depending on the direction of the shift, an individual may end up with either an extra lumbar segment or one fewer segment, which can have significant biomechanical and clinical implications.

LUMBARISATION

SACRALISATION



All vertebrae originate from somites that form along the cranial-caudal axis, on either side of the notochord, from presomitic mesoderm. These somites differentiate further into dermomyotome (future inner dermis and muscle) and sclerotome. At the fourth week of development, the sclerotome becomes filled with diffuse core cells. The sclerotome then ruptures and these cells, along with cells from the ventromedial wall, migrate anteriorly towards the notochord and posteriorly towards the neural tube . The notochord becomes surrounded by mesenchyme, by the end of the fourth week, which will later develop into the vertebral centrum. The cells that surround the neural tube will become the neural arch.

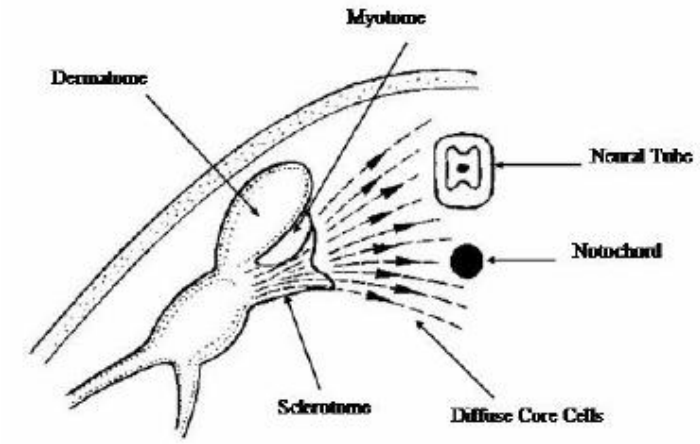
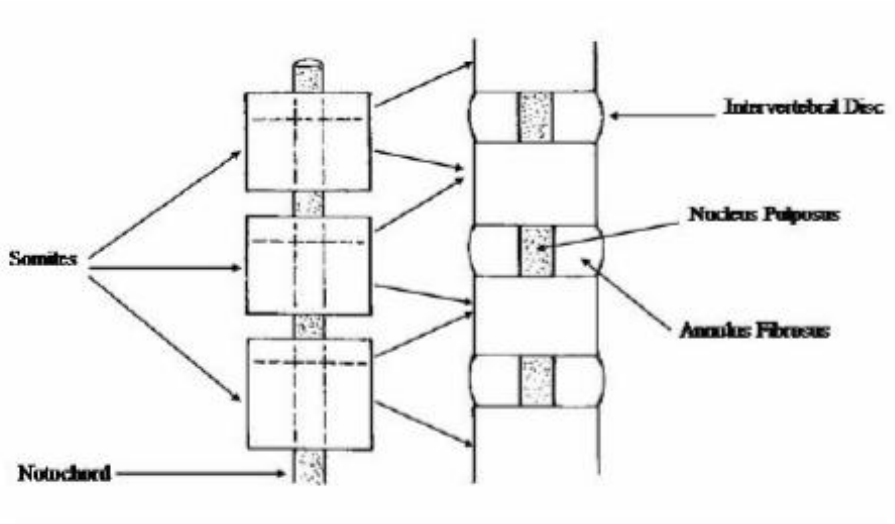


Diagram showing the migration of the diffuse core cells from the sclerotome to the neural tube and notochord.

There are multiple competing hypotheses regarding the formation of the vertebral column (Scheuer and Black, 2000) but the resegmentation hypothesis has gained the widest acceptance. According to the resegmentation hypothesis the segmental sclerotome undergoes resegmentation where the dense caudal half of the superior somite unites with the more diffuse cranial half of the inferior somite, forming the future vertebral bodies and ribs. The neural arch, pedicles, and costal elements develop almost entirely from the dense caudal half of each somite and thus attach to the upper end of the vertebral body.

The first four-and-a-half somites are incorporated into the occipital region of the skull; the caudal half of the fifth somite forms the body of the atlas along with the cranial half of the sixth somite (Pilbeam, 2004). The process proceeds cranial to caudal with normal development of somites 5-6 through 11-12 forming cervical vertebrae, 12-13 through 23-24 forming thoracic vertebrae, 24-25 through 28-29 forming lumbar vertebrae, 29-30 through 33-34 forming the sacrum, and 34-35 through approximately 39-40 forming the coccyx (though the number of coccyx segments varies) .



Schematic representation of the resegmentation hypothesis showing the cranial half of the lower somite joining with the caudal half of the upper somite forming the vertebral body and the notochord becoming the nucleus pulposus.

At six to seven weeks of embryonic development, four to six chondrification centers appear (two in the body, one in each half of the neural arch, and one for each rib), spreading out to form the cartilaginous anlagen.

With fusion at the spinous process, at the fourth fetal month, the cartilaginous vertebral units are complete. The final tally is thus 24 true vertebrae (being the cervical, thoracic, and lumbar regions) and nine false vertebrae (sacrum and coccyx regions) accounting for two-fifths of adult standing height with the addition of the intervertebral discs.

Intervertebral discs are formed between the cranial and caudal halves of each somite by the involution of the corda dorsalis during the cartilaginous and ossification stages. By the end of the sixth week of development, the notochord has retrogressed from the vertebral body space and has become condensed within the intervertebral space and becomes the nucleus pulposus . These notochord cells are eventually completely replaced by inner annulus fibrosus cells by about 20 years of age.

Genetic Factors :

Genetic factors are being held responsible for the segmental development of the lumbosacral spine. During embryogenesis, the somites are segmentally organised in pairs on both sides of the neural tube and are specific for the axial level at which they are positioned. This segmental identity of the somites is determined by different Hox-genes in the presomitic mesoderm [17] . The specific combination of Hox-genes that is expressed at a particular level seems to determine the axial identity of the resulting structures.

To support this hypothesis, Carapuco *et al*[17] showed that vertebral sacralisation can be induced in transgenic mice by Hox -11 expression. Wellik *et al* showed that in the absence of Hox11 function, sacral vertebrae are not formed and instead these vertebrae assume a lumbar

identity. In addition, they showed that in the absence of Hox10 function, no lumbar vertebrae are formed. Thus, these studies show that the normal patterning of lumbar and sacral vertebrae as well as the changes in the axial pattern, such as LSTV, result from mutations in the *Hox-10* and *Hox-11* paralogous genes. In addition, Erken *et al* found a significant association between sacralisation and cervical rib. The mechanisms responsible for the development of the lumbosacral spine may therefore influence the development of the cervical spine and vice versa.

Lumbar Anatomical Variation

The improper formation and union of somites can cause vertebral abnormalities, including block vertebrae, cleft vertebra, and unilateral and bilateral hemivertebrae Block vertebrae are the result of improper separation of the superior and inferior portions of adjacent somites, causing a single continuous vertebral body to form composed of two segments.

Cleft vertebrae are the result of improper union of the two halves, resulting in paired hemivertebrae that assume a “butterfly” shape. Unilateral and bilateral hemivertebrae result from improper pairing of the left and right halves of the somite, with some somites being excessive, resulting in the formation of wedge shaped vertebrae on one side.

A further abnormality of the lumbar vertebrae is the formation of lumbar ribs, usually at the L1 or L2 levels. These can be unilateral or bilateral, and usually resemble elongated transverse processes and never articulate with the costal cartilage or the sternum. These vertebrae, despite the presence of ribs, are considered lumbar vertebrae due to the lumbar orientation of the articular facets.

While these lumbar ribs have no direct effect on the lumbosacral border, they are a potential further cause of degeneration of intervertebral discs at lower levels due to reduction in mobility of the adjacent motion segments. Similarly, twelth rib can sometimes be absent or hypoplastic in which case it is difficult to differentiate it from the transverse process at the thoracolumbar junction.

CLASSIFICATION SYSTEMS :

CASTELLVI et al CLASSIFICATION :

In 1984, Castellvi et al described a radiographic classification system identifying 4 types of LSTVs on the basis of morphologic characteristics. Lumbosacral transitional vertebrae have been classically identified by using lateral and AP radiographs .

Type I :

Includes unilateral (Ia) or bilateral (Ib)dysplastic transverse processes, measuring at least 19 mm in width.

Type II :

Includes incomplete unilateral (IIa) or bilateral (IIb) Lumbarisation/ sacralisation with an enlarged transverse process that has a diarthrodial joint between itself and the sacrum

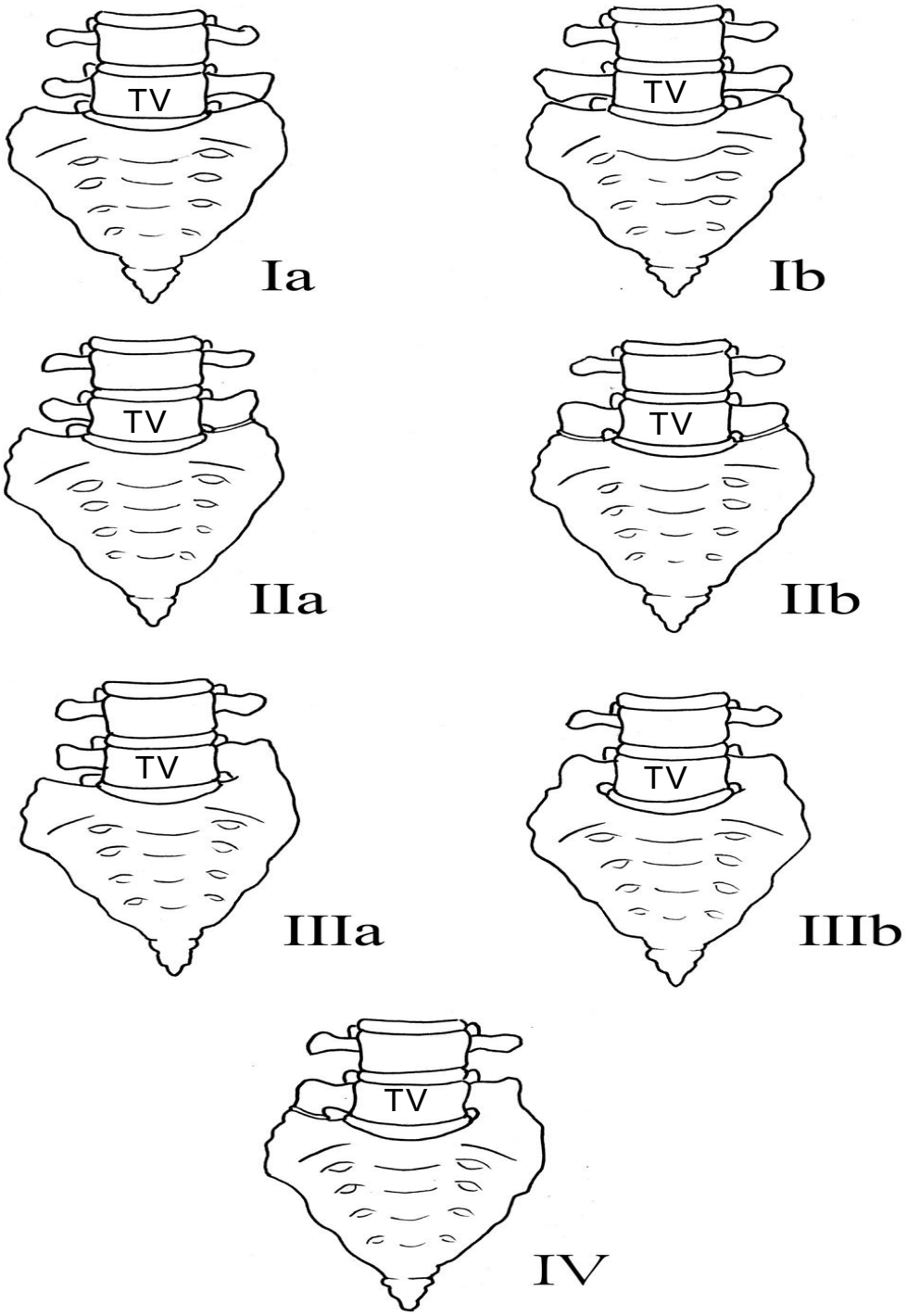
Type III:

Includes unilateral (IIIa) or bilateral (IIIb) Lumbarisation/ sacralisation with complete osseous fusion of the transverse process(es) to the sacrum.

Type IV :

Includes a unilateral type II transition with a type III on the contralateral side.

Although useful for characterizing the relationship between the transitional segment and the level above or below, this classification system does not provide information relevant to accurate enumeration of the involved segment.



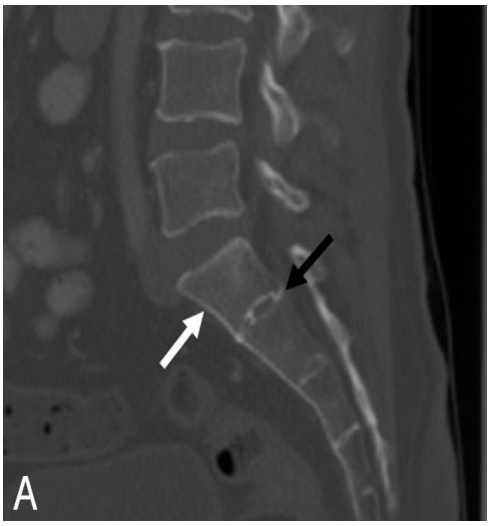
* TV – Transitional Vertebra

CASTELLVI et al CLASSIFICATION OF LSTV

SQUARING / WEDGING OF LSTV :

Other morphologic characteristics of transitional vertebrae include squaring of the upper sacral segment when it is lumbarised and wedging of the lowest lumbar segment when it is sacralised[33]**.** These morphologic changes represent cranial and caudal shifts of the spine, respectively, resulting in either a greater or lesser number of motion segments. Wigh and Anthony describe the "squared" appearance of transitional vertebrae on lateral radiographs as the ratio of the AP diameter of the superior vertebral endplate to that of the inferior vertebral endplate as ≤ 1.37. This relative "squaring" and "wedging" represent a spectrum of vertebral body morphologic change and cannot be reliably used to definitively identify an LSTV.

Lumbarised S1 vertebral body showing "squaring" of a S1 vertebral body and fully-sized lumbar type disc between S1 and S2



Sacralised L5 vertebral body showing " wedging" of the L5 body and decreased disc space between L5 and S1

O' DRISCOLL CLASSIFICATION : (Based on S1 S2 disc morphology)

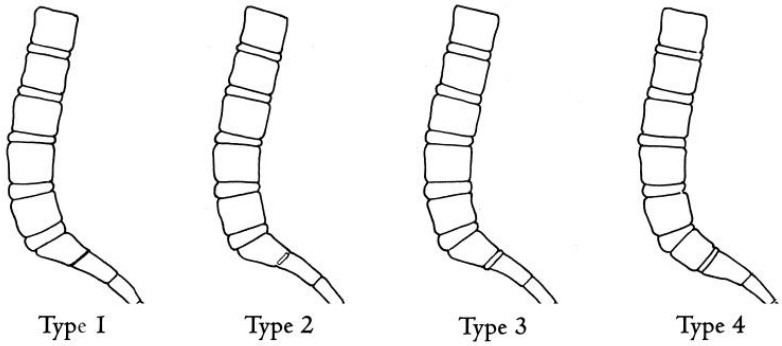
O'Driscoll [34] et al developed a 4-type classification system of S1–2 disc morphology by using sagittal MR images, depending on the presence or absence of disc material and the AP length of the disc.

Type 1 exhibits no disc material and is seen in patients without transitional segments.

Type 2 consists of a small residual disc with an AP length less than that of the sacrum. This type is also most often seen in patients without transitional segments.

Type 3 is a well-formed disc extending the entire AP length of the sacrum and can be seen in normal spines as well as in those with LSTVs.

Type 4 is similar to type 3 but with the addition of squaring of the presumed upper sacral segment. Good correlation was found between a type 4 S1–2 disc and an S1 LSTV (Castellvi type III or IV)



O' DRISCOLL classification based on S1 S2 disc morphology

Nicholson et al[14] described a decreased height on radiographs of the disc between a lumbar transitional segment and the sacrum compared with the normal disc height between L5 and S1. Similarly, it has been observed that when a lumbarised S1 is present, the disc space between S1 and S2 is larger than the rudimentary disc that is most often seen in spines without transitions.

Numbering Technique : [28- 36]

1. Plain X ray LS spine - counting from last rib.
2. Sagittal MRI whole spine – counting from C2 downwards.
3. Axial MRI – Identification of iliolumbar ligaments

Not only is identification of an LSTV important, accurate numeric Identification of the vertebral segments on MR imaging[31] is essential before surgery. Inaccurate numbering may lead to an interventional procedure or surgery at an unintended level. Establishing whether an LSTV is a lumbarised S1 or a sacralised L5 on MR imaging alone can often be problematic. Conventional spine radiographs are often unavailable at the time of imaging, and cervicothoracic localizers may not be routinely obtained. Radiographs of the entire spine allow the

radiologist not only to count from C2 inferiorly but also to differentiate hypoplastic ribs from lumbar transverse processes, therefore enabling counting of the number of thoracic segments and correct identification of the L1 vertebral body. After this vertebral body is correctly identified, determining the correct numeric assignment of the LSTV is possible. More commonly, lumbar spine radiographs alone are available .In these cases, correct enumeration can often be achieved, but there remain cases in which it is difficult to differentiate hypoplastic ribs from transverse processes at the thoracolumbar junction.

Hahn et al[32] first described the use of a sagittal cervicothoracic MR localizer to better evaluate transitional vertebrae. With a sagittal MRlocalizer, the vertebrae may be counted in a caudad direction from C2 rather than cephalad from L5. Using a sagittal cervicothoracic MR localizer alone assumes 7cervical and 12 thoracic vertebrae and does not account for thoracolumbar transitions or allow differentiation of dysplastic ribs from lumbar transverse processes. The addition of a coronalMRcervicothoracic localizer increases the accuracy of enumerating lumbosacral transitional vertebrae because it allows better differentiation at the thoracolumbar junction.

Another technique used to correctly number an LSTV is locating the iliolumbar ligaments [30], because they reliably arise from the L5 transverse processes. The iliolumbar ligament functions to restrain flexion, extension, axial rotation, and lateral bending of L5 on S1. It is seen as a low-signal-intensity structure on both axial T1- and T2-weighted MR images as a single or double band extending from the transverse process of L5 to the posteromedial iliac crest.

Hughes and Saifuddin[30] labeled an LSTV as L5 when no iliolumbar ligament was identified at the level above. When an iliolumbar ligament was seen to arise above the LSTV, then the vertebral body with the iliolumbar ligament was labeled L5 and the LSTV, as S1.

This technique has limitations because it assumes that there are always 7 cervical, 12 thoracic, and 5 lumbar vertebrae. Various segmentation anomalies may occur along with thoracolumbar transitional vertebrae, and in these cases, identification of the iliolumbar ligament alone is not sufficient to accurately identify the L5 vertebral body.

Additional landmarks for numbering vertebra :

The use of anatomic markers, including the aortic bifurcation, right renal artery, and conus medullaris has been reported to be least reliable. Although Lee et al [36] report the position of the aortic bifurcation and right renal artery to be reliable landmarks for determining the lumbar vertebral segments on MR imaging and CT, these anatomic markers are widely believed to be less than satisfactory. Although the right renal artery is usually located at the L1–2 disc space, 25% of the time it is either not imaged or is present at another location. Variability may be seen in the position of the aortic bifurcation as it has been found at L4 in 83% of patients. Lee et al have also shown that the conus medullaris should not be used as a landmark because its position is quite variable.

Therefore, Identification, of LSTV, Communication between radiologists and surgeon, and Correlation of intraoperative and preoperative imaging become of paramount importance to avoid surgical intervention at wrong level.

Clinical Significance

Bertolotti syndrome [19 / 20/ 24], the association between an LSTV and low back pain, is controversial and has been both supported and

disputed since Bertolotti first described it in 1917. Although not initially described, the low back pain of this syndrome is currently thought to be of varying etiologies, subsequently arising from different locations: 1) disc, spinal canal, and posterior element pathology at the level above a transition 2) degeneration of the anomalous articulation between an LSTV and the sacrum; 3) facet joint arthrosis contralateral to a unilateral fused or articulating LSTV and 4) extraforaminal stenosis secondary to the presence of a broadened transverse process.

In most of the literature that supports Bertolotti syndrome, the implicated transitional segments are Castellvi types II-IV. Castellvi states that type I LSTVs are of no clinical significance and are a "forme fruste" and therefore have no relation to what was initially described as Bertolotti syndrome. However, Aihara et al[16] determined that short and broad iliolumbar ligaments lend a protective effect to the L5-S1 disc space and potentially destabilize the L4-L5 level. There may be an association of such iliolumbar ligament morphology with broadened long transverse processes (Castellvi type I) . This could potentially lend some credence to an association of low back pain with a type I LSTV but requires further investigation.

Elster[20] found that the incidence of structural pathology (disc pathology, spinal and foraminal stenosis) did not differ in with LSTV compared with those without transitional vertebrae. However, the distribution of pathology was markedly different in that lesions occurred at the intervertebral disc space above the level of the transitional vertebra almost exclusively and never between the LSTV and the sacrum. Although Taskaynatan et al [21] did not find an increased incidence of pathology in patients with LSTV, they reported increased severity of low back pain in patients with LSTV and an associated increase in nerve root symptoms.

Other studies of patients being imaged for low back pain or surgery for disc pathology demonstrated a greater than expected number of transitional vertebrae. Multiple studies have shown an increased incidence of disc pathology above LSTVs. Luoma et al[6] reported an increased risk of early degeneration in the upper disc in young patients, but this change was obscured by age-related changes in the middle aged population. Epstein et al described increased disc herniation in adolescents with spinal anomalies, including LSTV.

Stability in LSTV :

Transitional vertebrae likely affect the normal biomechanics of the lumbar spine. The lack of mobility at a fused transitional level or the decreased mobility at a partially fused or anomalously articulating vertebra lends stabilization to this level. A decreased prevalence of disc pathology was found in the disc below the transitional vertebral body. This may be explained by the altered biomechanics from the aberrant joints between the LSTV and sacrum. First, there is restricted motion between the transitional vertebra and sacrum due to the anomalous articulation and/or bony fusion. The load can, therefore, be effectively absorbed by the fused transverse process or the aberrant joint decreasing motion and relieving stress on the intervertebral disc. This results in preservation of disc integrity seen on MR imaging as normal bright signal intensity within the nucleus on T2-weighted sequences.

The increased stability between an LSTV and the sacrum can potentially lead to hypermobility above the transitional segment, at the ipsilateral anomalous articulation and/or at the contralateral facet joint. Elster [20] likened the hypermobility at the disc level above the LSTV to adjacent-level disease seen at spinal segments above and below postsurgical fusion masses or a block vertebra.

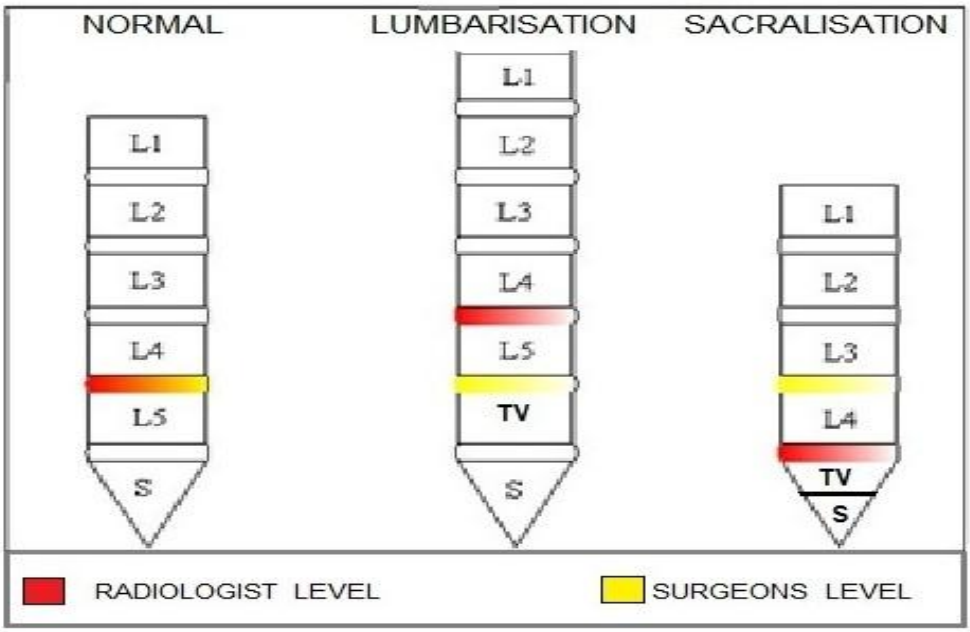
Hypermobility and abnormal torque moments at the intervertebral disc are believed to place the disc and facet joints at increased risk of accelerated degeneration. Additionally, Aihara et al[16] found that the iliolumbar ligaments above an LSTV were thinner and weaker, potentially further predisposing this level to hypermobility and premature degeneration. No difference has been reported in the incidence of spondylolysis or spondylolisthesis between patients with LSTVs and controls[25]. It has been observed that in patients with lytic spondylolisthesis, there is a greater degree of slip seen at the L4–5 level above an L5 transition compared with the L5-S1 level above an S1 transition.

Wrong-Level Spine Surgery :

The accurate assessment of spinal segmentation is crucial in eliminating surgical and procedural errors because most wrong-level spine surgery occurs in patients with variant spine anatomy, including LSTVs[1]. Surgical errors occur when MR imaging of the lumbar spine is reported without accompanying conventional radiographs or cervicothoracic MR localizers. Because intraoperative radiographs are used during spinal surgery for confirmation of disc level, it is important to correlate prior MR imaging with these radiographs. As important is

obtaining high-quality intraoperative lateral radiographs. Lack of correlation by the operating surgeon of intraoperative radiograph with the preoperative sagittal MR imaging can lead to the dreaded consequence of wronglevel spine surgery To prevent this complication, it is imperative that there is communication between the radiologist and the surgeon regarding numbering of vertebral segments before surgery **.**

Radiologists count Vs Surgeons count :



While doing lumbar disc surgery, the surgeon will identify the disc level (for eg. L4L5 level, the most common level of disc prolapse) by counting from below upward from the last space .whereas, the radiologist will give the report by counting from above downwards from the C2 body (MRI) or last rib (x ray).

Both surgeons level and radiologist level will coincide if the vertebral configuration is normal without any transitional vertebra , as shown in the figure.(red marking represents radiologist level and yellow marking represents surgeons level).

In cases of lumbarisation, due to the presence of additional space between S1 and S2 , the surgeon will go one level below the radiologist level and both will not coincide resulting in wrong level surgery.

Similarly, in cases of sacralisation, due to the absence of space between L5 and S1, the surgeon will go one level above the radiologist level , resulting in wrong level surgery.

So, in cases of LSTV, Intraoperative image guidance with c arm and correlation with the preoperative imaging can avoid surgical intervention at wrong level.

SURGICAL TREATMENT OF LUMBAR DISC DISEASE :

1. ANAESTHESIA AND POSITIONING :

The surgical procedure is usually performed under general anaesthesia with the patient in a prone or knee-elbow position. A number of operative frames are available; however, the surgeon may elect to support the chest and abdomen with sheet rolls that extend from

the shoulders to the lower pelvis. It is important to avoid the application of pressure on the thorax and abdomen if epidural bleeding is to be minimized. The patient's back should either be flat or in a slightly flexed position.

2. INCISION AND EXPOSURE :

The essentials of an operation are adequate Localisation ,a small skin incision, careful dissection, adequate lighting and magnification, and meticulous hemostasis. The incision varies several inches in length, beginning at the superior spinous process and extending to the interspinous space . The dissection is carried down to the spinous processes. The deep fascia is incised off midline to minimize postoperative pain. The two adjacent lamina are then exposed with subperiosteal dissection. Even with a short incision, the laminar arches are exposed laterally to the articular facets. Most surgeons normally uses a Taylor retractor to maintain exposure, but other systems are equally effective. With a short incision, it is difficult to ascertain the correct level by palpation, because only one level is exposed.

3. IDENTIFICATION OF LUMBOSACRAL JUNCTION :

The lumbosacral junction may be identified in a number of ways:

a. on the basis of palpation, because the sacrum has a characteristic "feel" and because the lamina at L5 has a sharp edge.

b. on the basis of the motion of the junction when the spinous process at L5 is grasped from an instrument; or

c. by sound, because the sacrum has a characteristic resonance when it is percussed.

However, the surgeon should realize that any of these methods may yield potentially misleading results, particularly in patients with lumbosacral transitional vertebrae.

When any doubt as to the proper level exists, confirmatory radiographs should be obtained; correlation with the preoperative imaging should be done for correct Localisation of level.

4. LAMINECTOMY AND BONY REMOVAL :

After the correct space has been exposed, using a high-speed drill to remove the lower edge of the lamina, with bone removal being carried laterally into the medial facet. Sometimes, as the dissection continues, the surgeon may remove the upper portion of the inferior lamina as well. Unless the interspace is quite large, it is nearly always necessary to remove some bone. It is very important to carry out

sufficient bone removal for adequate exposure of the dural sac and nerve root.

Failure to do so may result in the inability to locate a disc fragment in an unusual site (e.g., the axilla of the nerve root), in incomplete removal, or, conceivably, in injury to a nerve root.

5. IDENTIFICATION OF ROOT AND DISC BULGE :

After initial bone removal, the ligamentum flavum is lifted with a nerve hook or forceps and incised. A cotton pledget with a string attached to it may be inserted through this opening to push away extra dural fat and the dura, while the remainder of the yellow ligament is removed. This is done with a small Kerrison punch. At this point, the some surgeons may also remove additional bone laterally and inferiorly if adequate visualisation of the nerve root is necessary. This should be done under direct visualisation, and extreme care is required if damage to the root, which may be displaced from its normal position, is to be avoided. The lateral edge of the dural envelope and the nerve root must then be identified on blunt dissection and separated from the underlying disc protrusion. If necessary, additional bone may be removed once the nerve root is identified so that it can be safely retracted over the underlying disc fragment. It should be remembered that some patients

may have anomalous roots and that the relationship of the takeoff of the nerve root to the disc varies from patient to patient. Insertion of cotton pledgets (with marking strings) above and below the disc protrusion aids in exposure and helps control bleeding. Bipolar coagulation is important in obtaining hemostasis; a dry field and good visualisation of neural structures are vital.

6. DISCECTOMY :

Once the root has been identified and mobilized, it is normally displaced medially to expose the interspace. Occasionally, a large sequestered fragment of disc located in the axilla between the nerve root and the dural sac must be removed before the root can be safely moved. Careful inspection and insertion of a nerve hook or angled probe helps in revealing the location and size of disc fragments. The presence of a rent or hole in the annulus indicates extrusion of the fragment. More commonly, the surgeon sees a shining localized bulge at the interspace or over the adjacent posterior border of the vertebral body, where a fragment has dissected up or down from the interspace between the posterior longitudinal ligament and the body. When this ligament is opened with a knife, the degenerated disc material extrudes spontaneously. Less often, the interspace merely seems soft on

palpation, but the disc bulges perceptibly when the table is straightened. An opening is made into the interspace with a small knife, and extensive removal of the fragmented disc and cartilaginous plate is carried out with the use of various pituitary grabbers and curets.

Considerable care and skill are required when the disc protrusion is very large or in an unusual location. The exposure should be adequate to retract the nerve root safely and to permit complete removal of a very large extruded fragment. It should also be adequate to allow exploration of the axilla of the nerve root when a protrusion is not found lateral to the root or when physical examination or diagnostic studies suggest a lesion in the axilla. Similarly, if a far lateral disc herniation is suspected, enough bone removal should be performed so that an excised disc in that location can be identified. When carrying out facetectomy and lateral exploration, care must be taken to avoid injury to the superior root, which is present in the foramen.

Following removal of the disc fragment and curettage of the disc space, cotton pledgets and retractors should be removed, and a final exploration carried out with a nerve hook. Normally, the dural sac and root are seen to pulsate; if they do not, the surgeon should be suspicious that fragments have been retained.

Epidural bleeding is then controlled with bipolar coagulation or a small amount of Gelfoam. A free fat graft is employed to obliterate dead space and, it is hoped, to reduce epidural scar formation. The incision is then closed in layers, according to the preference of the surgeon.

7. POST OPERATIVE ADVICE :

If small incisions and meticulous technique have been used, most patients go home 1 to 2 days after the surgery. Patients are required to reduce their activity for a period of several weeks and are given instructions advising them to avoid heavy lifting, prolonged sitting, and bending. Patients begin an exercise program about 6 to 8 weeks after surgery. They can generally return to office work within 2 to 6 weeks after discharge and advised to avoid unnecessary heavy lifting and bending .

VARIOUS METHODS OF LUMBAR DISC SURGERY :

- COMPLETE LAMINECTOMY AND DISCECTOMY
- HEMILAMINECTOMY AND DISCECTOMY
- MICROLUMBAR DISCECTOMY
- PERCUTAEOUS DISCECTOMY

A special situation exists when a very large central disc herniation is present or when the diagnosis is uncertain. In these instances,

a hemilaminectomy may not provide sufficient exposure for management of the problem. In the first situation, limited bone removal may not allow for adequate exposure and retraction of the dura and may result in injury to the cauda equina. A complete laminectomy permits adequate bilateral exposure and safe retraction of the neural elements. In the second instance, even with the use of modern imaging techniques, certain lesions, such as a tumor or intradural disc herniation, may cause diagnostic confusion In cases of uncertainty, a complete laminectomy permits adequate visualisation of the vertebral canal. Most far-lateral disc herniations can be reached and removed with the standard intralaminar exposure and relatively wide bone removal.

Microdiscectomy represents a refinement of the standard hemilaminotomy with emphasis on magnification, improved lighting, and careful hemostasis. As indicated, however, when microdiscectomy is performed, adequate bone resection and visualisation of the neural elements are important for safe and effective operation.

Percutaneous discectomy utilizes an oblique approach and various techniques for removal of herniated disc. A refinement of this technique involves the use of a suction aspirator. It is not whether such techniques are superior to the posterior approach, and, in fact, some data suggest that the results are not as good as those obtained with the standard operation.

MATEIRALS AND METHODS

MATERIALS AND METHODS

This study was done prospectively in 244 cases admitted with lowback pain and got operated for lumbar disc prolapse in the department of Neurosurgery, Govt. Stanley hospital, Chennai during period the from 2007 -2011

Inclusion criteria:

Any patient with low back/ radicular pain with radiologically significant lumbar disc prolapse, who are potential candidates for surgery.

Exclusion criteria:

Low back pain patients who are managed conservatively.

Patients who are not willing for surgery.

Methodology:

- Detailed history and thorough examination of patients admitted with low back / radicular pain and / or limb weakness.
- Radiological evaluation to look for lumbar disc prolapse and LSTV (lumbarisation or sacralisation) , and correctly numbering it.
    a. X ray lumbosacral spine (including D12 spine)
    b. MRI LS spine with cervicothoracic localizer (counting from C2)
    c. MRI axial view to look for iliolumbar ligaments
- Surgical treatment for appropriate patients

  Lumbar laminectomy and discectomy,

  Hemilaminectomy and discectomy,

  Microlumbar discectomy
- Intra operative image guidance during surgery (C arm) with preoperative image correlation to avoid surgical intervention at wrong level.
- Post op x ray taken to confirm correct level of surgery.

RESULTS AND DISCUSSIONS

TABLE 1 : INCIDENCE OF LSTV IN STUDY POPULATION

	TOTAL NO. OF CASES	PERCENTAGE
LSTV	32	13.1 %
NORMAL SPINES	212	86.9 %
TOTAL	244	100 %

TABLE 2 : SEX INCIDENCE OF LSTV IN STUDY POPULATION

	MALES (%)	FEMALES (%)	TOTAL
LSTV	22 (12.6 %)	1O (14.2 %)	32
NORMAL SPINES	152 (87.4 %)	60 (85.8 %)	212
TOTAL	174 (100 %)	70 (100 %)	244

TABLE 3. INCIDENCE OF LUMBARISATION / SACRALISATION IN LSTV

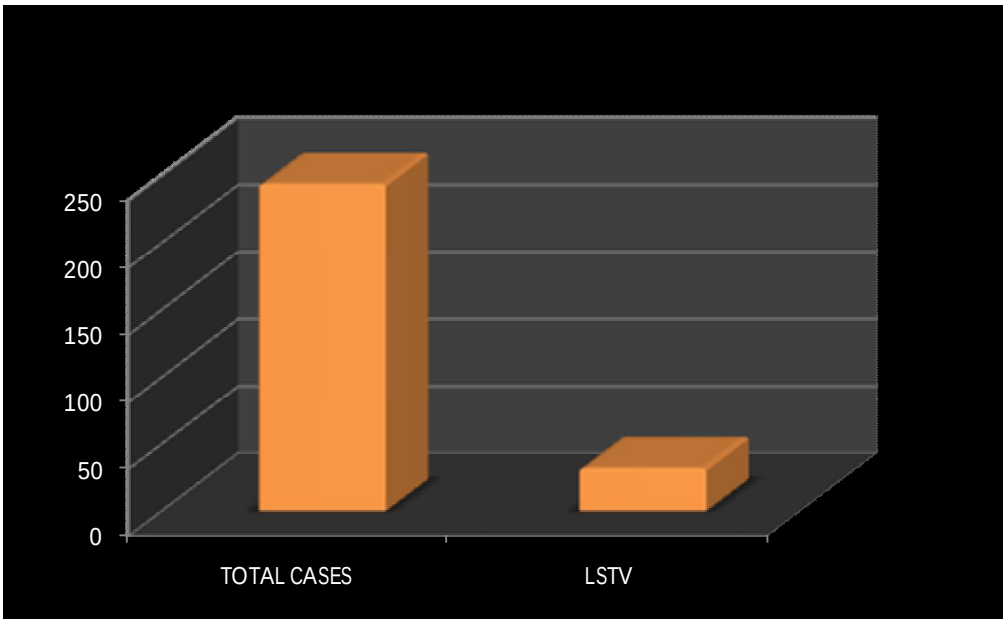
	MALE	FEMALE	TOTAL	PERCENTAGE
SACRALISATION	16	6	22	68.8%
LUMBARISATION	6	4	10	31.2 %
TOTAL	22	10	32	100 %

TABLE 4 : AGE DISTRIBUTION IN STUDY POPULATION

	MALE	FEMALE	TOTAL	PERCENTAGE
20-30	4	4	8	3.3 %
30-40	61	29	90	36.9 %
40-50	73	25	98	40.2 %
50-60	36	12	48	19.8 %
TOTAL	174	70	244	100 %

DISCUSSION :

INCIDENCE OF LSTV :



- Totally 244 cases of lumbar disc prolapse were operated in the study period and included in the study.
- Of these cases, LSTV were present in 32 cases and the incidence is 13.1 %.
- Among the total 244 cases, 174 were male (71.3 %) and 70 patients (28.7 %) were females
- Age group varies from 21- 59 (mean 42.5).

Survey of prevalence of LSTV in the various observational studies :

AUTHOR	No. OF PATIENTS	TRANSITIONAL VERTEBRA	LUMBARISATION	SACRALISATION
Quinlan	769	35 (4.6 %)		
Hughes	500	67 (13.4)	21 (4.2)	46 (9.2)
Delport	300	90 (30 %)		
Peterson	353	43 (12.2 %)		
Taskaynatan	881	41 (4.7 %)		
Luoma	163	49 (30 %)		
Steinberg	464	85 (18.3 %)	20 (4.3 %)	65 (14%)
Kim	690	41 (5.9.%)	29 (4.2 %)	12 (1.7 %)
Chithriki	441	37 (8.4 %)	15 (3.4 %)	22 (5.0.%)
Otani	1009	119 (11.8 %)		
Erken	729	262 (35.9.%)		
Santiago	138	26 (18.4 %)	10 (7.2 %)	16 (11.6 %)
Hsieh	1668	67 (4 %)		
Dai	460	126 (27.4 %)		
Peh	129	17 (13.2 %)	9 (7 %)	8 (6.2 %)
Cadeddu	299	16 (5.4 %)		
Vergauwen	350	53 (15 %)		
O'driscoll	100	15 (15 %)		
Hald	5781	792 (13.7 %)	341 (5.9 %)	451 (7.8 %)
Hahn	200	24 (12 %)	9 (4.5 %)	15 (7.5 %)
Elster	2000	140 (7 %)		
Leboeuf	530	61 (11.5 %)	32 (6.0 %)	29 (5.5 %)
TOTAL	**17954**	**2206 (12.3 %)**	**486 (5.5 %)**	**664 (7.5 %)**
Present study	**244**	**32 (13.1 %)**	**10 (4.1 %)**	**22 (9.0 %)**

This is prospective study of Lumbosacral transitional vertebra done during the period between 2007 to 2011. We have studied the prevalence, sex distribution,radiological methods of identifying LSTV and surgical significance in lumbar disc surgery and compared with various studies done earlier in the literature.

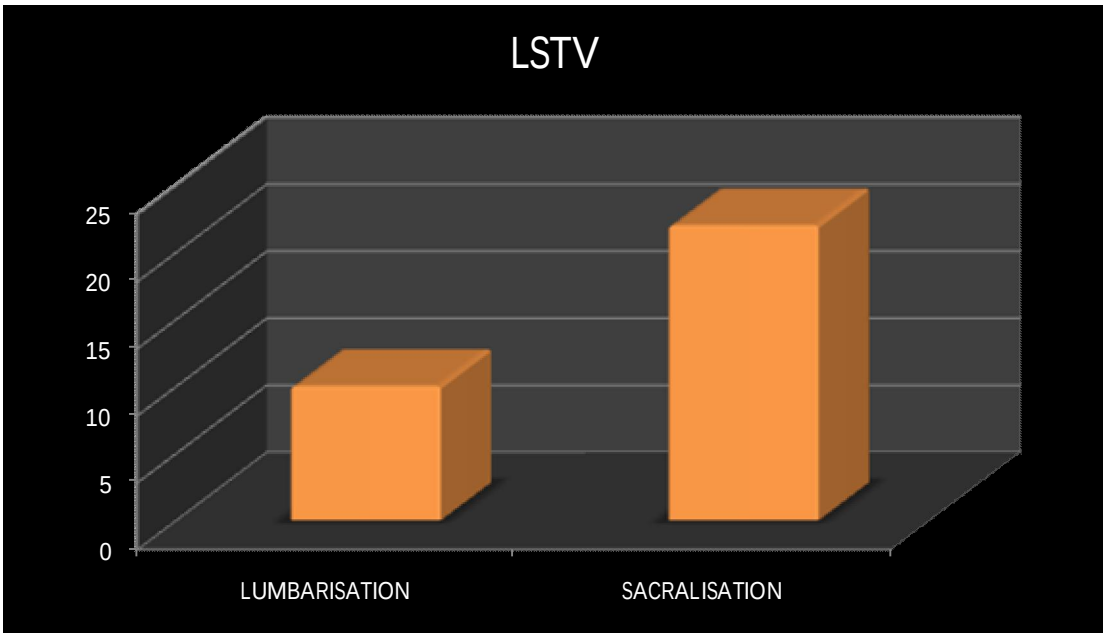
The prevalence of LSTV reported in the literature ranges from 4 to over 35% .[2-4]

The highest incidence of 35.9 % was found in Erken et al series with a study population of 729. The lowest incidence of 4% was found in Hsieh et al with a population of 1668.

This wide range may be explained by differences in diagnostic criteria, imaging techniques, and confounding factors between the investigated population samples.

In a systematic review of comparable observational studies from 1986 to date we found a mean prevalence of 12.3% . The prevalence in our study was 13.1 % and is comparable with most studies.

LUMBARISATION/ SACRALISATION :



- Among the 32 cases of LSTV, 22 were lumbarised vertebra (68.7%) and 10 were sacralised vertebra (31.3 %)
- The incidence ratio of sacralisation to lumbarisation is approximately 2 : 1and sacralisation is the common LSTV.
- Among 22 cases of sacralisation, 16 were male and 6 were females and the ratio of male to female with sacralisation is approximately 3 : 1
- Among 10 cases of lumbarisation , 6 were male and 4 were female and the ratio of male to female with lumbarisation is approximately 1.5 : 1

Prevalence of lumbarisation / sacralisation in various studies :

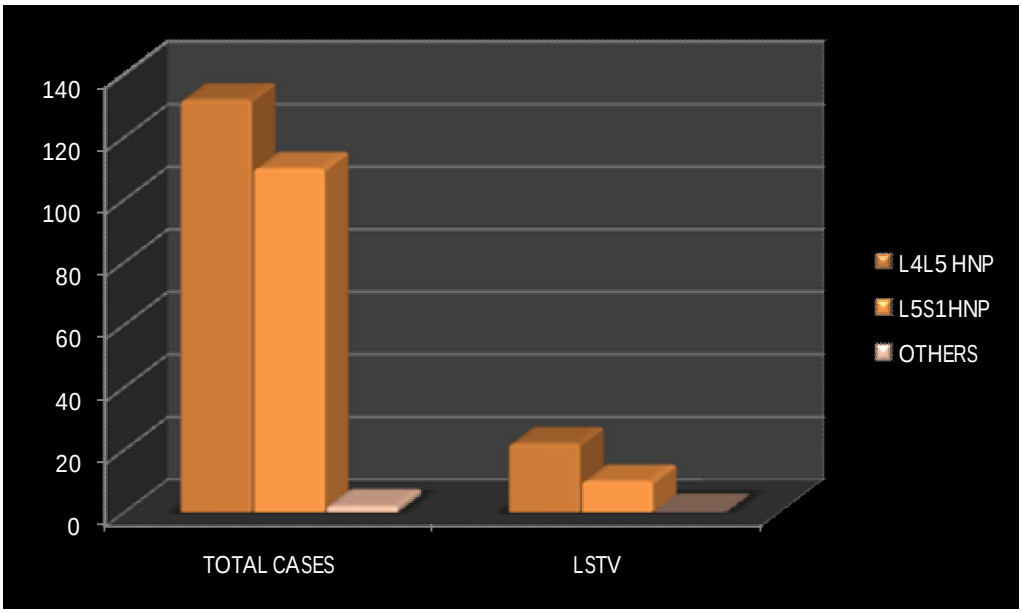
AUTHOR	LSTV	LUMBARISATION	SACRALISATION
Hughes	67	21 (31.3 %)	46 (68.7 %)
Steinberg	85	20 (23.5 %)	65 (76.5 %)
Kim	41	29 (70.7 %)	12 (29.3)
Chithriki	37	15 (40.5 %)	22 (59.5 %)
Santiago	26	10 (38.5 %)	16 (61.5 %)
Peh	17	9 (52.9 %)	8 (47.1 %)
Hald	792	341 (43.05 %)	451 (56.95 %)
Hahn	24	9 (37.4 %)	15 (62.6 %)
Leboeuf	61	32 (52.5 %)	29 (47.5 %)
TOTAL	**2206**	**486 (22.03 %)**	**664 (77.97 %)**
Present study	**32**	**10 (31.3 %)**	**22 (68.7 %)**

In almost all the authors series , sacralisation is more common than lumbarisation approximately in the ratio of 2:1 to 3:1 , except in the series of Kim et al, where lumbarisation is common.

In a systematic review of comparable observational studies from 1986 to date we found a mean prevalence of sacralisation 78 % and lumbarisation 22 % (approximately in the ratio of 3 : 1)

The prevalence of sacralisation in our study was 68.7 % and of lumbarisation was 31.3.% (in the ratio of approximately 2 : 1) and is comparable with most studies.

LEVEL OF DISC PROLAPSE :



- Totally 244 cases cases were studied. Among these, 132 were L4L5 disc prolapse (54 %), 110 were L5S1 disc prolapse (45 %) and other levels were 2 cases (<1 %).
- Among those patients with LSTV (32 CASES), 22 were L4L5 disc prolapse (68.7 %), 10 were L5S1 disc prolapse (31.3%) and other disc levels were 0 %.
- All cases with sacralised vertebra have L4L5 disc prolapse and all cases with lumbarised vertebra have L5S1 disc prolapse.
- Disc herniation is always noted above the transitional vertebra and not below that level (L4L5 disc prolapse in sacralisation and L5S1 disc prolapsed in lumbarisation) [7/ 16]

Patients with LSTV are often suggested to be prone to various secondary pathologic spinal conditions including intervertebral disc herniation and/or degeneration, facet joint arthrosis and spinal canal or foraminal stenosis. For most conditions, however, convincing evidence is lacking in the scientific literature.

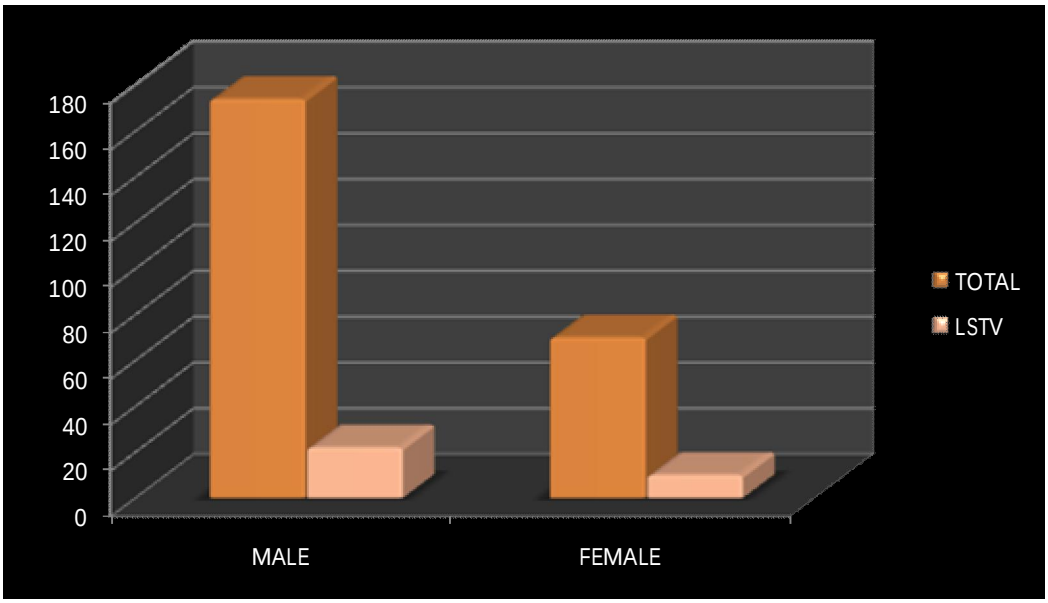
Elster et al [20] noticed a significant difference in the distribution degenerative disc herniation, as it occurred in patients with LSTV, was nine times more common at the level immediately above the transitional vertebra compared to patients without LSTV. The increased risk for disc herniation or degeneration at the disc level above the LSTV was confirmed by other studies .

Luoma *et al* [6] showed that disc degeneration above the LSTV was more frequent in young patients ; but during aging these degenerative disc changes became less obvious and were masked by regular degenerative changes.

Increased disc degeneration of the disc above a LSTV is attributed to its relative hypermobility This may be analogous to the advanced degeneration adjacent to a block vertebra or an interbody fusion mass . Conversely, LSTV is reported to prevent the development of degenerative disc disease of the disc below the LSTV the disc below.

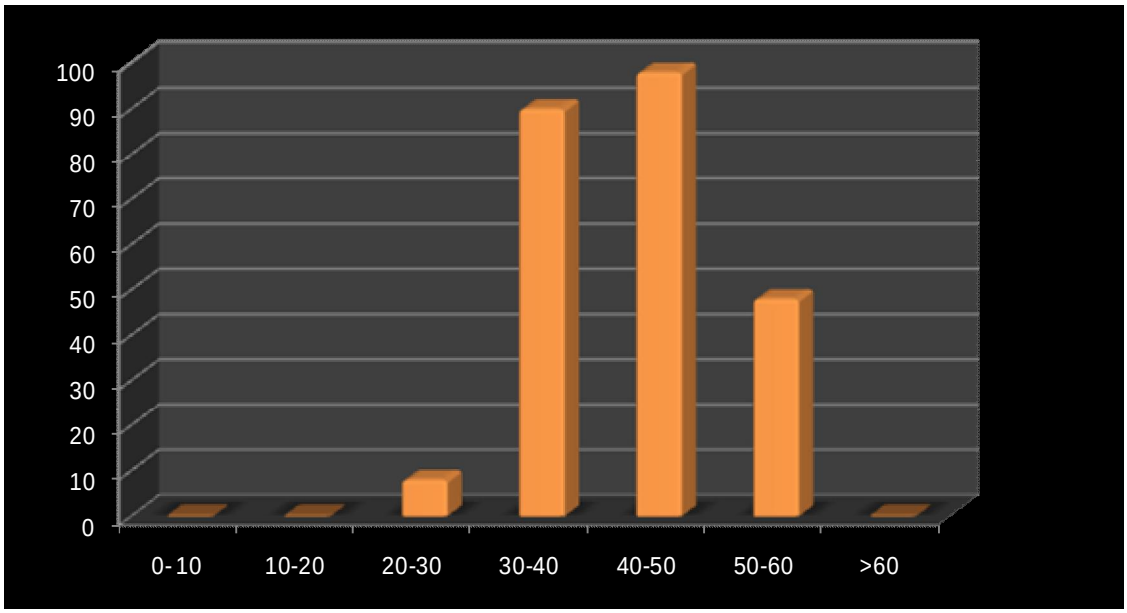
In this study, in all cases of LSTV, disc prolapse is at the level above the transitional vertebra, and is comparable with that of all studies.

SEX DISTRIBUTION :



- Among the study population (244 cases), 174 were males (71.3 %) and remaining 70 were females (28.7 %).
- Among the LSTV patients (32 cases),22 were males (68 .7 %). and remaining 10 were females (36.3 %).
- The incidence of LSTV among male population were 12.6 % (22 out of 174)
- The incidence of LSTV among female population were 14.2 % (10 out of 70).
- Among 22 cases of LSTV in males, 16 were sacralised and 6 were lumbarised (ratio of sacralisation to lumbarsation approx 3:1).
- Among 10 cases of LSTV in females, 6 were sacralised and 4 were lumbarised (ratio of sacralisation to lumbarisation approx 1.5:1).

AGE DISTRIBUTION :

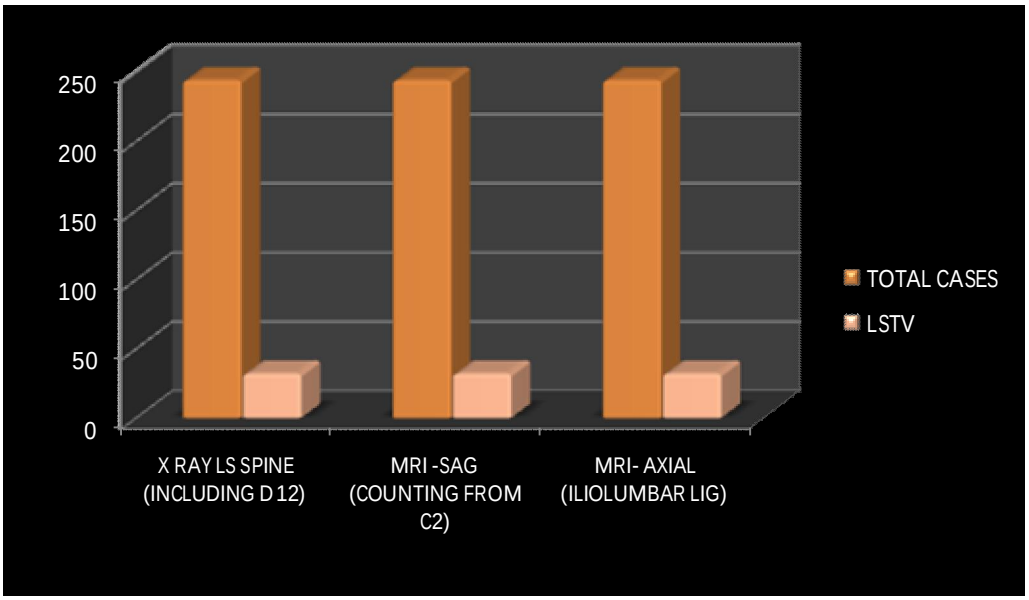


- Among the study population (244 cases), the age distribution is as follows : 8 patients are in the age group 20-30 (3.3 %), 90 patients are in the age group 30 -40 (36.9 %), 98 patients are in the group 40-50 (40.2 %) and 48 patients were in the group 50-60 (19.8 %).

- Among the 32 cases of LSTV, 1 patient is the group 20-30 (3.1 %), 14 patients were in the group 30-40(43.7 %),12 patients were in the group 40-50 (37.5 %)and 5 were in the group 50- 60 (15.6 %).

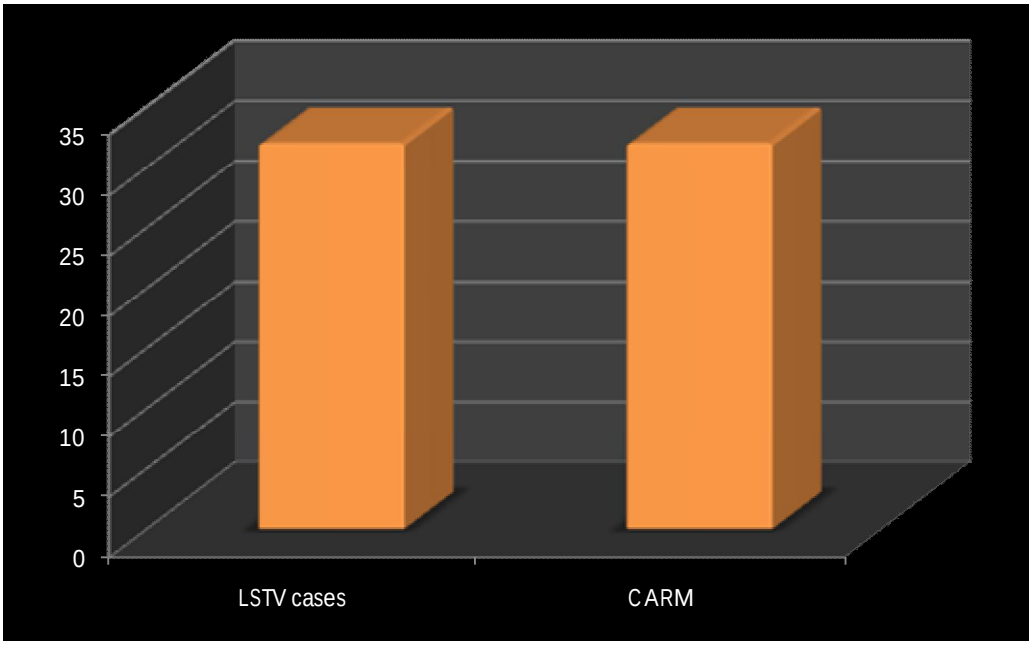
- The common age group of LSTV (30 -50) parallels with that of lumbar disc Prolapse (age 30 – 50).

PREOPERATIVE IMAGE LOCALISATION :



- All patients in the study population (244 cases) planned for lumbar disc surgery were evaluted for the presence of LSTV using the following three radiological methods. (100 %)
- Plain X ray LS spine (including D12) to look for any anomalous articulations at lumbosacral junction/ and the presence of LSTV (lumbarisation / sacralisation)
- MRI LS Spine sagittal view with cervicothoracic localizer to count the vertebra from C2 down to look for LSTV (lumbarisation / sacralisation).
- MRI axial view to identify iliolumbar ligaments for confirmation of LSTV (lumbarisation / sacralisation).
- The reliability of identifying LSTV is 100 % when these combined radiological methods were used.

INTRA OPERATIVE LEVEL LOCALISATION :



- All cases diagnosed preoperatively as LSTV (32 cases) in this study population were done surgical procedure with intraoperative image guidance.

- Among 244 cases of disc prolapse , intraoperative C arm were used in all 32 cases of LSTV for level Localisation.

- Post op lumbosacral spine x ray were taken to confirm correct surgical level.

- Among the 32 cases of LSTV cases operated with these image guidance and preop image correlation, surgical error was 0 %

CONCLUSION

CONCLUSIONS

1. LSTV occurs in significant percentage in patients with low back pain. (13.1 % in this study)
2. An association between the transitional vertebra and herniation in the disc above has been found in patients with low back pain .i.e., Disc herniation is always noted above the transitional vertebra and not below that level (L4L5 disc prolapse in sacralisation and L5S1 disc prolapse in lumbarisation)
3. Sacralisation is common LSTV than lumbarisation approximately in the ratio of 2:1
4. There is no sex predilection for LSTV in this study population.
5. The common age group is between 30- 50 , parallels with that of lumbar disc prolapse.
6. The reliability of combined radiological methods (x ray LS spine with D12 , MRI sag to count from c2, MRI axial to look for iliolumbar ligaments) to identify and correctly numbering LSTV is 100 %.
7. Intra operative image guidance with C arm and correlation with preop radiological imaging will avoid surgical intervention at wrong level (Surgical error 0 %)
8. With recent trends of minimally invasive techniques in spine surgery , knowledge of LSTV is important in disc localisation

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APPENDIX

APPENDIX - I

PROFORMA OF THE STUDY

Name:

Age / Sex:

Occupation:

Address& contact number:

OP/IP no.:

HISTORY:

Low back pain :

- duration
- radiating (radicular) pain
- claudication pain
- aggravating / relieving factors

Weakness of lower limbs:

- Tripping of toes/ dragging of feet/ buckling of knees
- gait

Numbness of lower limbs:

- radicular/ dermatomal distribution

Bladder/ bowel symptoms :

H/o trauma /Lifting heavy weights:

PAST H/O Medical illness : Similar episodes/Diabetes/ Hypertension.

PAST H/O Surgeries : YES / NO

PERSONAL H/O: Smoker / Alcoholic

FAMILY H/O:

OCCUPATIONAL HISTORY :

PHYSICAL EXAMINATION :

General exam:

Built / Nourishment /Anemia/ cyanosis/ clubbing

Vital signs :

Pulse/ Blood pressure/ Temp / Resp rate

Neurological examination :

Higher functions/ cranial nerves

Spinomotor system :

Upper Limbs :

Bulk/ tone/ power/ reflexes/ sensation.

Lower limbs :

Bulk/ tone/ power/ reflexes/ sensation.

Lasegues test (SLRT) :

Elys test (reverse SLRT)

Patrics test :

Cerebellar signs.:

Gait:

Spine and Cranium :

EXAMINATION OF OTHER SYSTEMS:

PROVISIONAL DIAGNOSIS:

Lumbar disc prolapse - level ?

with secondary canal stenosis- ?

INVESTIGATIONS:

BIOCHEMICAL INVESTIGATION:

BLOOD:

- Sugar / Urea / Creatinine / Electrolytes
- Hb / TC / DC / ESR / platelets

URINE

- Routine

RADIOLOGICAL INVESTIGATION :

- X ray LS spine - AP/ Lat (covering D12 and S1)
  - Presence of LSTV (Lumbarisation / Sacralisation)
- MRI LS spine with whole spine screening
  - Presence of LSTV (Lumbarisation / Sacralisation)
- MRI LS Spine axial – to look for iliolumbar ligaments\
  - Presence of LSTV (Lumbarisation / Sacralisation)

TREATMENT:

- Surgery – laminectomy and discectomy
  - Hemilaminectomy and discectomy
  - Microlumbar discectomy
- Intraoperative image guidance :C arm – for level localisation

POST OP:

- Neurological assessment – improvement/ static/ worsen.
- Post op x ray LS spine – to confirm correct level of surgery

FOLLOW UP:

APPENDIX -II

PATIENT CONSENT FORM

STUDY TITLE: A Study of Lumbosacral Transitional Vertebra (LSTV) And its Significance in Lumbar Disc Surgery.

Study centre : Dept. of Neurosurgery, Stanley medical college, Chennai-1.

Patient's name :

Patient's age :

Identification No.:

I confirm that I have understood the purpose of this study. I have the opportunity to ask the questions and all my questions and doubts were answered to the best of my satisfaction.

I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without my legal right being affected. I understand that the ethic's committee and the regulatory authorities will not need my permission to look at my health records both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study.

I agree to this access, however, I understand that my identity would not be revealed .In any information released to the third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.

I agree to take part in the above study and to comply with the instructions given during the study and to faithfully to cooperate with the study team, and to immediately inform the study staff if I suffer from any deterioration in my health or my well being or any expected or unusual symptoms.

I hereby give consent to participate in this study.

Signature / Thumb impression of the patient :

Place :

Patient’ s name and address :

Signature of the investigator :

Name of the investigator :

APPENDIX – III MASTER CHART

S.NO	PATIENT NAME	PATIENT AGE	SEX	IP NO.	DATE OF SURGERY	SIGNS AND SYMPTOMS	*PREOP IMAGING (X RAY + MRI LS SPINE)*	LSTV	SURGERY DONE	INTRA OP IMAGING	POST OP X RAY LSSPINE
1.	KASTURI	40	F	026525	13.8.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LLAMINECTOMY + L4L5 DISCECTOMY	----	CORRECT LEVEL
2	KANGEYAN	34	M	26567	13.8.07	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
3	SIVA	30	M	27898	26.9.07	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
4	SELVARAJ	60	M	29278	26.9.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LLAMINECTOMY + L4L5 DISCECTOMY	----	CORRECT LEVEL
5	GURUSAMY	55	M	34280	12.10.07	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
6	KESAVAN	40	M	34281	12.10.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
7	KALIAPPAN	56	M	34290	14.10.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
8	SAURAV	44	M	27123	7.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
9	MEENAL	32	F	27654	7.11.07	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
10	BHAVANI	45	F	37483	9.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LLAMINECTOMY + L4L5 DISCECTOMY	----	CORRECT LEVEL
11	KUMARESAN	33	M	37878	9.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
12	MADHAN	43	M	37765	21.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
13	MANJULA	52	F	38500	21.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
14	MURUGAN	54	M	38567	21.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

15	MURUGESAN	52	M	38767	23.11.07	L5 RADICULOPATHY	*L4 L5 HNP*	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
16	LAVANYA	32	F	38798	23.11.07	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
17	RAMACHANDRAN	47	M	01872	4.2.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
18	MANOHARAN	46	M	060465	6.2.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
19	ARULRAJ	42	M	4793	18.2.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
20	SHANTHA	65	F	5647	3.3.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
21	CHINNAPONNU	50	F	1227	5.3.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
22	DEENADAYALAN	44	M	1232	5.3.08	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
23	MADAVAN	34	M	1345	7.3.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
24	LATIF	51	M	1434	7.4.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
25	DHANAMMAL	36	F	10130	9.4.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
26	KASIYAMMAL	60	F	13186	2.5.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
27	MUNIYAPPAN	44	M	13667	2.5.08	L5 RADICULOPATHY	*L4 L5 HNP*	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
28	MYTHILY	30	F	13567	4.5.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
29	HEMA	28	F	13876	4.5.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
30	KASI	40	M	13176	4.6.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
31	VENKAT	30	M	13789	6.6.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL

32	RAVANAMMA	40	M	13776	6.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
33	RAJAN	34	M	13879	8.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
34	GANESAN	32	M	13898	8.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
35	VANKATAIYA	36	M	13721	18.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
36	KUMARAVEL	44	M	13746	20.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
37	SUGANYA	32	F	13878	20.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
38	LAVANYA	34	F	13898	22.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
39	SHAHEEN	29	F	13723	22.6.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
40	GURU	40	M	13792	25.6.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	------	CORRECT LEVEL
41	RADHA	52	F	13917	4.7.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
42	KUPPAN	45	M	13998	4.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
43	SUGANYA	54	F	13898	7.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
44	SURESH	35	M	13812	9.7.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
45	MOHAN	44	M	13989	9.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
46	SAKTHIVEL	34	M	13999	11.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
47	RANGARAJAN	34	M	14545	14.7.08..	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
48	KUPPAN	25	M	14321	14.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

49	NATESAN	56	M	13423	25.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
50	RAJALAKSHMI	45	F	14123	25.7.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
51	DEVAKI	41	F	14009	6.8.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
52	INDRA	36	F	14345	8.8.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
53	ILAYARAJA	44	M	14354	8.8.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
54	SURESH	54	M	14665	10.8.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
55	SANTHANAKRISHNAN	34	M	14787	20.8.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
56	KOKILA	28	F	14765	20.8.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
57	MOHAMED ALI	56	M	14321	22.8.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
58	ALEXANDER	40	M	13997	27.8.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
59	RUDRAN	30	M	14456	3.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
60	GOPAL	38	M	14786	3.9.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
61	CHINNAPONNU	26	F	14765	10.9.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
62	MEENAKSHI	57	F	14798	10.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
63	MAHESH	34	M	14765	10.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	SACRALISATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
64	AKILESH	44	M	14567	10.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
65	CHINNA	56	M	14888	20.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

66	KURESHI	56	M	14990	20.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
67	KURIEN	60	M	14876	22.9.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
68	PARASURAMAN	59	M	14987	1.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
69	SANTHANAM	45	M	14721	1.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
70	VARALAKSHMI	44	F	14699	8.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
71	VEERA	43	M	14701	8.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
72	MOORTHY	34	M	14709	15.10.08	S1 RADICULOPA73THY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
73	NARASIMMA	46	M	14888	15.10.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
74	KAPOOR	32	M	14898	17.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
75	RAJESH	34	M	14907	17.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
76	RANGANATHAN	45	M	14934	20.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
77	KULASEKAR	54	M	14897	20.10.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
78	YADHAV	45	M	14767	20.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
79	MOHAN	44	M	14567	31.10.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
80	SAKTHIVEL	44	M	14654	7.11.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
81	CHITRA	34	F	14763	10.11.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
82	JAMEEL	37	M	14711	12.11.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

83	PONNAMBALAM	38	M	14800	14.11.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
84	MUTHU	34	M	14999	19.11.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
85	FARZANA	34	F	14879	19.11.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
86	KAMALA	45	F	14890	21.11.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
87	REVATHI	54	F	15110	6.12.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
88	RAJA	34	M	15112	6.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
89	RATHINAM	45	M	15009	8.12.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
90	KESAVAN	54	M	15121	8.12.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
91	FAROOK	43	M	15223	10.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
92	PETER	34	M	15010	10.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
93	ABDUL REHMAN	43	M	15007	12.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
94	MONAL	32	F	15245	17.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
95	HIRALAL	44	M	15432	17.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
96	KUNJITHAPATHAM	54	M	15665	24.12.08	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
97	MEENAKSHI	32	F	15678	24.12.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
98	VARADHAN	34	M		24.12.08	L5 RADICULOPATHY	*L4 L5 HNP*	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
99	KALIL BASHA	35	M	813/09	30.1.2009	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL

100	YUVARAJ	42	M	927/09	30.1.2009	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
101	SELVARAJ	45	M	235/09	2.2.2009	LBA WITH SCIATICA	*L3L4 HNP*	NO	L3 LAMINECCTOMY + L3L4 DISCECTOMY	-------	CORRECT LEVEL
102	SHANMUGAM	22	M	2885	4.2.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
103	BABU	31	M	3185	4.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
104	PURUSHOTHAMAN	35	M	3206	9.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
105	VALLIAMMAL	60	F	3197	9.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
106	SELVAM	45	M	3460	11.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
107	DHANAM	40	F	4128	13.2.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
108	KRISHNAN	32	M	4717	16.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY + L4L5/ DISCECTOMY	-------	CORRECT LEVEL
109	MARI	30	M	5241	18.2.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
110	RAMESH KUMAR	35	M	5910	25.2.09	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY + L5S1 DISCECTOMY	C ARM	CORRECT LEVEL
111	NALLAPPAN	55	M	5248	27.2.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
112	GOPAL	41	M	6805	4.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
113	GOPI	24	M	6564	9.3.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
114	NATARAJAN	45	M	7660	11.3.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
114	MEGANATHAN	32	M	6107	13.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
115	LAKSHMI	35	F	7434	16.3.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL

116	SULOCHANA	40	F	8242	23.3.09	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
117	PAVENTHAN	38	M	9042	23.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
118	SAMYKANNU	45	M	7087	25.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
119	ASIRVATHAM	53	M	8329	25.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
120	KAMATCHI	50	F	6705	30.3.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
121	SELVI	40	F	10219	1.4.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
122	DURAISAMY	36	M	10401	6.4.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
123	THULASIRAMAN	40	M	10756	13.4.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
124	SUBURATHNAM	45	F	11583	17.4.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
125	KANNAN	33	M	12329	20.4.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
126	SUMATHI	28	F	12567	24.4.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
127	PRABHU	22	M	13193	27.4.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
128	BANUMATHY	45	F	12558	29.4.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
129	ROKSHANA	45	F	13194	4.5.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
130	MALLIGARJUN	44	M	15750	15.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
131	MURALIRAJAN	37	M	14348	15.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
132	MAHADEVAN	41	M	13429	22.5.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL

133	MURUGESAN	42	M	15142	22.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
134	VENKATESAN	27	M	15424	22.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
135	SARADHA	45	F	15735	29.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
136	NARAYANAN	32	M	17598	29.5.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
137	AMUDHA	27	F	17604	1.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
138	SELVAM	51	M	15959	3.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
139	SEETHA	31	F	15989	3.6.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
140	SETHUPATHY	33	M	15909	3.6.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
141	NEELAKANDAN	35	M	16754	5.6.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
142	DEICY	38	F	16967	5.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
143	JAYANTHI	42	F	17895	5.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
144	RUCKMANI	33	F	18524	12.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
145	PANDURANGAN	54	M	62275	12.6.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
146	BABU	35	M	21319	26.6.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
147	THEEPANCHAM	43	M	42588	3.7.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
148	GOKUL	22	M	21528	3.7.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL

149	CHANDRAN	37	M	22850	20.7.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
150	MADHAN	36	M	23059	22.7.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
151	SURESH	30	M	23498	24.7.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
152	SAILENDRAN	35	M	23170	27.7.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
153	SUMATHY	37	F	24945	29.7.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
154	SARAVANAN	36	M	25333	31.7.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
155	KANDASAMY	52	M	25347	31.7.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
156	SHANKAR	39	M	24696	5.8.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
157	ANBALAGAN	26	M	26048	5.8.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
158	THANGAVEL	35	M	26195	10.8.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
159	PITCHAI	46	M	25341	10.8.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
160	VARADHARAJ	45	M	25599	12.8.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
161	RAVANAMMAL	45	F	29031	31.8.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
162	KRISHNAN	35	M	29581	7.9.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
163	VIJAYA	53	F	28761	11.9.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
164	PONNAMMAL	52	F	30107	14.9.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
165	VIJAYA	27	F	30686	16.9.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

166	THENMOZHI	43	F	31586	25.9.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
167	MASI	47	F	32500	30.9.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
168	MARI	35	M	35602	23.10.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
169	SUBBIAH	31	M	37535	6.11.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
170	ARUMUGAM	45	M	36236	9.11.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
171	MALLIGA	46	F	36595	11.11.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
172	GOVINDAMMAL	45	F	37537	16.11.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
173	MEERA	41	F	37997	16.11.09	S1 RADICULOPATHY	*L5S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5S1 DISCECTOMY	C ARM	CORRECT LEVEL
174	BABU	40	M	39216	23.11.09	S1 RADICULOPATHY	*L5S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5S1 DISCECTOMY	C ARM	CORRECT LEVEL
175	SELVI	38	F	41382	4.12.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
176	SRINIVAS	38	M	41628	14.12.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
177	RAJENDRAN	49	M	41375	16.12.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
178	RENU	29	M	43142	23.12.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
179	USHA	25	F	43221	23.12.09	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
180	AMSA	52	F	43802	6.1.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
181	HALEEN JAHAN	45	F	41166	8.1.09	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

182	PARASURAMAN	53	M	43384	11.1.10	L5 RADICULOPATHY	*L4L5 HNP*	SACRALI SATION	L4 LAMINECTOMY + L4L5 DISCECTOMY	C ARM	CORRECT LEVEL
183	KANCHANA	50	F	2256	22.1.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
184	SAKTHIVEL	21	M	2232	25.1.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
185	THAGASEENA	30	F	3156	29.1.10	L5 RADICULOPATHY	*L4L5 HNP*	SACRALI SATION	L4 LAMINECTOMY + L4L5 DISCECTOMY	C ARM	CORRECT LEVEL
186	GOVINDASAMY	51	M	3143	5.2.09	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
187	BASKAR	40	M	4392	10.2.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
188	RAVI	53	M	4082	15.2.10	L5 RADICULOPATHY	L4L5 HNP	LUMBARI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
189	ROHINI	43	F	4368	19.2.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
190	MALLIGA	30	F	5191	22.2.10	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
191	FATHIMA BEEVI	37	F	6874	12.3.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
192	KRISHNAMMAL	56	F	9136	19.3.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
193	RANI	30	F	9723	24.3.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
194	POONAM	32	F	10348	29.3.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
195	BABY	47	F	11207	5.4.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
196	SAVIDHRI	45	F	9719	7.4.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
197	SELVAM	32	M	12913	19.4.10	L5 RADICULOPATHY	*L4L5 HNP*	SACRALI SATION	L4 LAMINECTOMY + L4L5 DISCECTOMY	C ARM	CORRECT LEVEL

198	KUMAR	40	M	14053	26.4.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
199	CHINNADURAI	54	M	16040	14.5.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
200	KANNIAPPAN	48	M	16009	14.5.10	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
201	KUMAR	45	M	17645	24.5.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
202	KUPPULAKSHMI	56	F	18662	24.5.10	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
203	PANDURANGAN	35	M	19166	7.6.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
204	BOOPATHY	35	M	63212	16.6.10	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
205	ANNADURAI	43	M	20894	21.6.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
206	ARUNARATHI	55	F	20312	23.6.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
207	RAJENDRAN	33	M	20567	23.6.10	S1 RADICULOPATHY	*L5 S1 HNP*	LUMBARI SATION	L5 LAMINECTOMY +L5 SI DISCECTOMY	C ARM	CORRECT LEVEL
208	JESSI	42	F	22324	30.6.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
209	SARAVANA	21	M	23660	7.7.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
210	ANBALAGAN	36	M	23441	7.7.10	L5 RADICULOPATHY	L4L5 HNP	SACRALI SATION	L4 LAMINECTOMY +L4 L5 DISCECTOMY	C ARM	CORRECT LEVEL
211	MANI	36	M	22397	14.7.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
212	RAJA	40	M	24806	21.7.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
213	PARIPRAKASH	35	M	23631	23.7.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

214	SRIRAM	44	M	25443	26.7.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
215	SARAVANAN	33	M	25704	28.7.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
216	MURUGAN	28	M	26394	2.8.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
217	THANIKACHALAM	55	M	28629	18.8.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
218	GANGAIAH	55	M	29304	20.8.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
219	RAJA	38	M	29528	23.8.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
220	DHANAM	53	F	29550	25.8.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
221	RAJAMANI	37	M	26126	27.8.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
222	VELAMMAL	41	F	30680	3.9.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
223	MOHANKUMAR	29	M	31071	6.9.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 HEMILAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
224	ARUMUGAM	40	M	28609	8.9.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
225	VENKATESH	40	M	28616	8.9.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
226	KANNAMMAL	50	F	35199	11.10.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
227	NAGABOOSHNAM	40	F	35542	13.10.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
228	KUMAR	50	M	35534	15.10.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
229	USMAN	30	M	36042	18.10.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
230	NAGAPPAN	30	M	65536	22.10.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

231	MICHAEL RAJ	37	M	37486	27.10.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
232	MOHAMED ALI	32	M	39878	12.11.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
233	KASIAMMAL	55	F	41908	1.12.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
234	INDIRA	28	F	41028	1.12.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
235	RAVANAMMAL	42	F	42435	8.12.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
236	MAHENDRAN	32	M	42292	8.2.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
237	MAHALAKSHMI	35	F	42701	15.12.10	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
238	BASHA	40	M	44616	24.12.10	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
239	MUNAF	19	M	3548	28.1.11	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
240	RAJENDRAN	43	M	2978	7.2.11	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
241	GUNASEKAR	41	M	5020	11.2.11	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
242	NALLATHAMBI	36	M	4296	11.2.11	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL
243	VASANTHA	55	F	3566	25.2.11	S1 RADICULOPATHY	*L5 S1 HNP*	NO	L5 LAMINECTOMY +L5 SI DISCECTOMY	-------	CORRECT LEVEL
244	JANSON	28	M	1009	25.3.11	L5 RADICULOPATHY	L4L5 HNP	NO	L4 LAMINECTOMY +L4 L5 DISCECTOMY	-----	CORRECT LEVEL

APPENDIX IV

CASE DEMONSTRATION

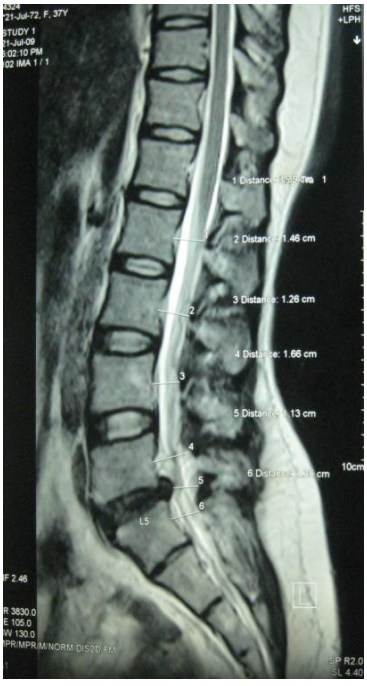
CASE NO : 1 (SACRALISATION)

CASE SUMMARY : (CASE NO. 153 : APPENDIX III)

- 37 YR WOMEN PRESENTED WITH C/O LOW BACK PAIN WITH LT. RADICULOPATHY – 3 MONTHS DURATION
- ON EXAMINATION, LEFT EHL WEAKNESS, NUMBNESS OVER L5 DERMATOME, LEFT SLRT 40 DEGREE.

PREOP IMAGING :

1) MRI LS SPINE :



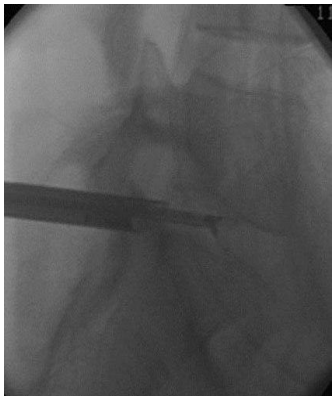
SAGITTAL / AXIAL VIEW SHOWING L4L5 DISC PROLAPSE

2) MRI WHOLE SPINE FOR LOCALISATION :

COUNTING FROM C2, SHOWS L4L5 HNP WITH SACRALISED L5

3. PREOP X RAY : SHOWING SACRALISATION (LSTV)

4. INTRA OPERATIVE C ARM : SHOWING L4L5 SPACE WITH SACRALISED L5



5. POST OP X RAY: SHOWING L4 LAMINECTOMY (CORRECT LEVEL)

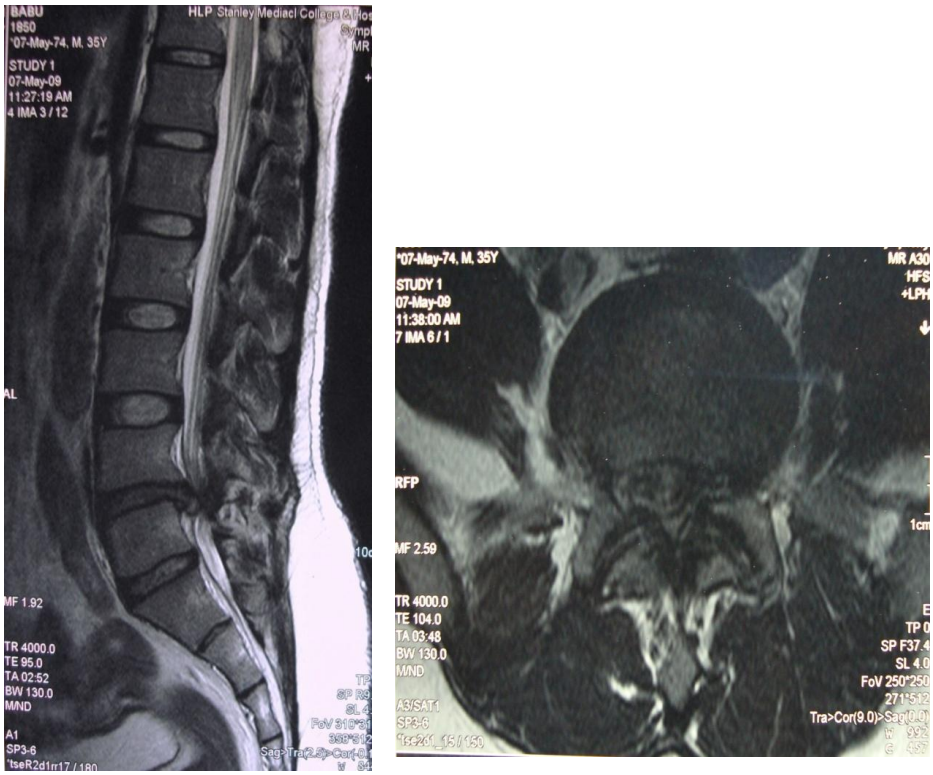
CASE NO : 2 (LUMBARISATION)

CASE SUMMARY : (CASE NO .174 APPENDIX III)

- 40 YRS OLD MEN PRESENTED WITH C/O LOW BACK PAIN WITH RT. RADICULOPATHY – 6 MONTHS DURATION
- ON EXAMINATION, RT. ANKLE JERK DIMINISHED, NUMBNESS OVER S1 DERMATOME, RT. SLRT 30 DEGREE

PREOP IMAGING :

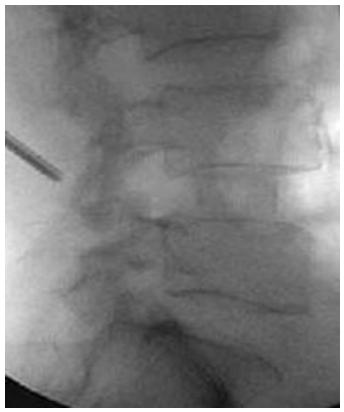
1) MRI LS SPINE :



SAGITTAL / AXIAL VIEW SHOWING L5S1 DISC PROLAPSE

2. PREOP X RAY SHOWING LUMBARISATION (LSTV)

3. INTRAOPERATIVE C ARM : SHOWING L5S1 SPACE WITH LUMBARISED S1



4. POST OP X RAY RAY SHOWING L5 LAMINECTOMY (CORRECT LEVEL)